



**Assessing domestic
water use habits**

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Assessing domestic water use habits for more effective water awareness campaigns during drought periods: a case study in Alicante, Eastern Spain

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Abstract

The design of water awareness campaigns could benefit from knowledge on the specific characteristics of domestic water use and of the factors that may influence certain water consumption habits. This paper investigates water use in 450 households of 10 municipalities of drought prone Alicante (Spain) with the objective of increasing knowledge about existing domestic water behavior and therefore help to improve the design and implementation of future water awareness campaigns. The survey results indicate that users already follow many of the conservation practices mentioned in messages. Moreover, campaigns need to take into account the differences in water use and habits derived from differences in urban models (concentrated or disperse).

1 Introduction

Water awareness campaigns constitute one of the pillars of water conservation policies in urban environments, especially during drought periods (Baumann et al., 1998; Woltemade and Fuellhart, 2013). Campaigns need to ensure that, especially when droughts strike, awareness and conservation messages are tailored to dominant water behaviors. Furthermore, information about household water uses and behaviors may improve the efficacy of messages aimed at consolidating conservation beyond the duration of droughts, which is one of the major challenges faced by policy makers in this topic (Wang et al., 1999). This paper investigates water use in Alicante, a drought prone area of coastal Mediterranean Spain. Coastal Alicante has been one of the fastest growing areas of Spain in recent years and combines one of the more important tourist areas in the Western Mediterranean with a very productive agricultural sector based on irrigation (Gil and Rico, 2008; Juárez, 2008). Both are important users of water in a region that, on the other hand, receives relatively little precipitation and registers long and intense droughts (Juárez et al., 2010). Drought and drought management, therefore, have historically been a key issue for Alicante (Gil, 2010; Hernández et al., 2010)

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and even more so with the discouraging prospects of climate change and their impact on water availability in the area (Saurí et al., 2013).

Traditional water policy has relied on the development of surface water through reservoirs and water transfers and, in many areas of the Mediterranean, also by the development of coastal groundwater sources (Olcina and Rico, 2006). However, dwindling and polluted water levels in aquifers and mounting economic, social and environmental costs of large surface water infrastructure have prompted a series of changes; above all the development of integrated water demand approaches stimulated by the European Water Framework Directive (EWFD) of 2000. These approaches face droughts through a combination of economic, technological and behavioral measures including awareness campaigns targeting especially urban and tourist uses. We argue, that in order the latter be successful it is much needed that the conservation messages and actions are aligned with existing uses and acknowledge heterogeneity of water users and uneven territorial development. The objective of this paper is therefore to provide a more accurate knowledge of existing behaviors in water use by urban households in Alicante. This can serve to design more effective water conservation campaigns during times of drought and even to consolidate reductions in water use after drought periods.

2 Water awareness campaigns during drought periods: strengths and weaknesses

Behavioral change regarding water consumption is perhaps one of the most sought after objectives of water conservation policies especially during times of drought (Hurli-
mann et al., 2009; Jorgensen et al., 2009; Fielding at al., 2012). To this end, water
planning and management must consider awareness campaigns as a tool contribut-
ing to reduce water demand and therefore ease drought impacts as well as the pres-
sures on the development of new water supply sources (Michelsen et al., 1999). Water
awareness campaigns, however, tend to produce mixed results, and for some experts,
who prefer economic instruments, are not very effective in curbing water consumption

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(Olmstead and Stavins, 2008). One first problem is the temporal horizon. Since most water awareness campaigns are implemented during drought periods of a variable length, their effectiveness may be limited to the duration of what is often considered an exceptional and not a normal event (Syme et al., 2000). Reductions in water consumption may also be highly variable, from 5 to almost 20 % in certain cases (March et al., 2013). More positive effects appear to be related to the intensity of campaigns (Wang et al., 1999) or when awareness campaigns are implemented together with other measures such as price increases (Nieswiadomy, 1992; Roibas et al., 2007). Furthermore, the success of awareness campaigns, especially in the long run also appears to be strongly related with the frequency and severity of drought conditions (Wang et al., 1999). In areas where droughts are not perceived as a problem or, at the most, as just a temporary condition, awareness campaigns may be less successful than in areas where droughts are more frequent (Howarth and Butler, 2004).

Besides all these problems, water awareness campaigns need to acknowledge already existing behaviors and the structural factors that may influence these behaviors. For example, in the drought stricken Barcelona Metropolitan Region, awareness campaigns insist on the need of showering instead of taking baths when a significant proportion of the housing stock (especially in low income neighborhoods) lacks bathtubs (March et al., 2013). In other cases, water conservation messages may lag behind existing urban realities, for example targeting indoor uses and ignoring outdoor uses or targeting population with already low water consumptions. The success of water awareness campaigns leading towards diminishing water use may depend on a wide variety of factors, some related to natural conditions (i.e frequency and magnitude of droughts) and other related to socio-demographic and predominant urban land uses (for an overview see Saurí, 2013). In the latter case, water awareness campaigns would benefit from certain knowledge of uses and especially habits of use of water in the areas targeted for the implementation of such campaigns. The information gathered could be useful in designing better campaigns especially regarding the development and phasing of certain water conservation messages. Hence the objective

of effectively engaging citizens in conserving water and, more importantly, making this engagement durable and less dependent on the occasional occurrence of drought periods could be more feasible.

3 The study area

Our study area includes 10 coastal (or located near the coast) municipalities of the province of Alicante (Spain) (see Fig. 1). The province of Alicante experienced a first important urbanization wave during the decades of 1960 and 1970 and a much more intense development process during the late 1990s and until 2008 (Hernández, 2013). Between 2001 and 2008, for instance, the number of housing units (apartments, condominiums and houses) built in Alicante rose to more than 354 000 (the highest number after Madrid and Barcelona, see Hernández et al., 2014). Increasingly, urbanization has followed a low-density pattern with houses and condominiums gaining presence over the more common apartment blocks and hotels of previous decades (Morote and Hernández, 2014). One peculiar characteristic of urbanization in this area has been its orientation towards international markets and particularly the segment of retirees from Western, Central and Northern Europe. In the northern municipalities of our case study area (l'Alfàs del Pi, Altea, Calp, La Nucia, Polop and Teulada), the arrival of new residents began in the late 1960s as a result of improving communications (the international airport of Alicante opened in 1967) and the availability of marginal agricultural land quickly transformed into urban land (Vera, 1987). In the southern municipalities (Rojales, San Fulgencio, San Miguel de Salinas and Torrevieja), the process is more recent but also more intense to the point that for some years of the late 1990s and early 2000 some of these municipalities topped the Spanish rankings in terms of housing construction permits (Romero et al., 2012). Again, most of the new housing stock was sold to European immigrants attracted by prices and comfortable climatic conditions as well as by increasing accessibility brought about by low cost flying. As we mentioned before, in the southern municipalities of Rojales, San Fulgencio or San Miguel

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de Salinas, the percentage of foreigners went from 35 % of the total in 2001 to more than 70 % in 2011. In others, such as Alfàs del Pi, Calp or Torrevieja, the number of foreigners exceeded 60 % of the total also in 2011 (Morote and Hernández, 2014).

Domestic water consumption in this area faces a number of important challenges.

5 First of all, precipitation is relatively low and subject to the vagaries of Mediterranean climatic conditions. It tends to decrease from North (some 550 mm year⁻¹) to South (300 mm year⁻¹) and observes large inter annual and intra annual variations with long periods of drought, and occasional, violent bursts of rainfall producing flash floods. In the late 1970s, for instance, the well-known tourist center of Benidorm had to be
10 supplied with sea tankers due to critical water shortages (Vera and Rico, 1995). More recently, during the early 1990s a number of successive droughts also caused supply problems in some coastal municipalities including the salinization of wells supplying domestic water (Rico, 2007). The 2013–2014 hydrological year has been the driest in over 100 years. Between January and August 2014, the city of Alicante, for instance,
15 received only 29 mm of rain when the historical average for this period is 170 mm. Most cities in the province have received at most 30 % of the average rain while in one case (El Campello) the figure was as low as 7 % and constituted a Spanish and European historical record (Laboratorio de Climatología, 2014). The drought has hit especially dry land agriculture and is expected to affect irrigated agriculture in the fall of 2014 if rain
20 does not fill the upland reservoirs. On the urban side, tensions regarding the impact on municipal supplies of the use of water for irrigating private gardens and filling up swimming pools have begun to appear in some of the northern towns (El País, 2014).

25 Second, the urban sector must face the competition of a dynamic and very productive agriculture that usually holds solid water rights to most fluvial courses. Third and perhaps more important, domestic water demand in most of the area displays a strong seasonal character with demand reaching a peak in July–August coinciding with the summer drought and with high water demand by the agricultural sector as well. For example, in the municipality of Torrevieja consumption jumps from 0.59 million m³ in December to 1.5 million m³ in August, that is, three times more. In general, domestic

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water use in the northern municipalities is higher than in the southern municipalities and generally stand above Spanish urban averages, which are about 150 L day⁻¹ person⁻¹ (henceforth lpd) (Table 1). Hence and despite the important efforts made in recent years to reduce water consumption there are still ample margins to continue with these efforts and water conservation campaigns may have a role in fulfilling this objective.

4 The experience of Alicante with water awareness campaigns

Recent water awareness campaigns in Alicante show a strong relationship with the drought periods of the past two decades, in particular with the episodes of 1992–1996; 1999–2001, and 2005–2007. The period 1992–1996 saw the worst drought in 25 years and observed the highest frequency and duration of water conservation campaigns. The association between droughts and water conservation campaigns is again visible in the current period of drought that began in October 2013 and that has produced the smallest amount of rain in one year in the city of Alicante since records exist. In general, institutional campaigns (i.e. by local, regional and national governments) do not have a specified duration and tend to be discontinuous in time with respect to the more regular campaigns by water companies. However, in the case of Alicante the latter have also relaxed their messages to customers possibly after the important decline (not directly drought-related) in domestic water consumption experienced in the city (20 % between 2007 and 2013). Besides government and water companies, other private companies (for instance a retail food chain) and civic groups such as association of parents and students of Alicante schools have promoted water conservation campaigns.

The specific characteristics of these campaigns can be very diverse, ranging from the free delivery to the public of water saving devices (flow regulators, for instance) to (less frequently) advice prepared for specific target groups (i.e. households with swimming pools). However the most common form of water awareness campaigns are messages appearing in the popular media and focusing on the necessity to modify water habits. In Alicante, messages insist on the fact that water is a scarce resource

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(especially in this area) and list afterwards a number of actions addressed to change water consumption habits. For example in the drought episode of 2005, the awareness campaign launched by the Spanish Ministry of the Environment was based on advice such as “take showers and not baths”; “turn off the tap while brushing your teeth” or “reuse your pool water”. The same appeal to civic duty appeared in other campaigns by private companies. While messages have not changed from past campaigns, target groups show significant shifts in focus. The general public is still the main recipient but over the last 10 years schoolchildren appear more and more as the specific objective of water (and environmental in general) conservation actions. The underlying rationale of this keen interest in children is first that messages may be better apprehended by this population segment and second that children, by influencing their parents, may become very active agents in changing water and other environmental habits at home. It is also thought that by focusing on children, the long-term effect of campaigns may be better ensured than with adults.

In sum, water awareness campaigns in Alicante are still strongly associated with drought periods and, for the most part, insist on the change of certain water consumption habits. The assumption that the general public may not be a trustworthy agent in this change of habits is corroborated by the growing emphasis on messages and all sorts of other activities addressed to children through strategies of environmental education. The current drought of 2013–2014 has begun to generate responses at the institutional level asking citizens to conserve water but so far using the same messages than in the past. The issue, however, is whether or not this change of habits constantly demanded by public authorities and private companies is already a part of the behavior of Alicante’s water users as we will attempt to examine in the next sections.

5 Materials and methods

Our investigation of water uses and habits of citizens in the province of Alicante involved 450 telephone surveys carried out between 11 and 14 July 2011 in the aforementioned

ten municipalities of the Alicante province. The sample was stratified according to the population living in each municipality selected (Table 1) with an estimated error of $\pm 4.62\%$ ($p = 0.005$).

The survey included 43 questions, most of them under the format “yes/no” and the rest under the format of multiple-choice. Respondents representing each household were asked to give their views on the characteristics of their homes and their water-using appliances (indoor and outdoor); the presence of water saving devices; their attitudes on water use (indoor and outdoor) and also their memories on water awareness campaigns. Socio-economic variables such as sex, age, income, or education were also introduced in the survey (see Table 2 for some examples of questions). It is important to mention that for the different questions there could be different numbers of “lost values”, i.e. people that did not answer a given question.

The average age of the respondents was 56.7 years. Over one third were men ($n = 162$) while around two thirds were women ($n = 288$). Average household size was 2.69 persons. Approximately 11 % of households included at least one person below 10 years ($n = 50$) while two thirds ($n = 300$) had at least one person over 60 years. Most of the interviewees were Spanish ($n = 398$) and almost one fourth of foreigners were British. Most of the surveys were responded by retired people ($n = 200$) and employed people ($n = 122$), and most of the respondents admitted a net income per household below EUR 36 000 per year ($n = 234$).

6 Survey results

The results of the survey are organized and presented next according to the following items: characteristics of the housing unit (apartment, single house or condominiums); water appliances; water use patterns, and perception of water awareness campaigns.

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6.1 Description of the home and outdoor water uses

Most of the surveyed people lived in detached or semi-detached houses ($n = 255$), followed by apartments ($n = 146$), and apartments in blocks with shared garden and swimming pool ($n = 49$). Most housing units were built after the 1980s. The average size of the home was 136.12 m^2 , while the median size was 100 m^2 approximately.

Around 40 % of respondents ($n = 178$) had a private garden. Most gardens occupied an area smaller than 20 m^2 ($n = 44$), followed by those between $21\text{--}50 \text{ m}^2$ ($n = 35$), and those between $51\text{--}100 \text{ m}^2$ ($n = 30$). We observed a non-negligible presence of gardens over 500 m^2 : those between $501\text{--}750 \text{ m}^2$ ($n = 14$) and those with more than 750 m^2 ($n = 16$). Lawns were absent in almost two thirds of the gardens ($n = 112$). Only 22 cases presented lawn areas in more than 50 % of the garden and the rest ($n = 44$) had lawn areas in less than 50 % of the garden.

Almost 3 out of 4 homes did not have any swimming pool ($n = 326$). Among homes with this facility ($n = 124$), half had community swimming pools ($n = 64$) and half had private swimming pools ($n = 60$). Most swimming pools had a closed system of water treatment ($n = 107$). The most frequent pool capacity was between 51 and 100 m^3 ($n = 48$).

6.2 Indoor water appliances and water saving devices

In what concerns water-using appliances, most homes had bathrooms with mixer taps ($n = 381$) while bathrooms with two separated taps were less frequent ($n = 120$) (some of the respondents had both). The average number of mixer taps at home was 4.76 while that of separated taps was 3.68. The lower average number of separated taps is related to the fact that in many cases they are combined with mixer taps in the same home, indicating possibly a gradual substitution of these fixtures. Concerning water saving devices, 38.6 % of the homes had some kind of flow restrictors in taps ($n = 171$), while the remainder 61.4 % ($n = 272$) did not control by any means the flow of tap water.

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Most of the homes had showers ($n = 401$) and the majority of showers were equipped with a single lever shower mixer ($n = 330$). The rest of showers had separated levers ($n = 69$) or a pushbutton ($n = 7$). As it happened with taps, some homes combined different kinds of showers. Concerning flow restrictors in the shower the percentage was similar to that of taps, but this time less people answered (yes = 36.7%; no = 63.3%). On the other hand, the most common bathtub was medium-sized ($n = 215$), followed by luxury bathtubs (> 350 L) ($n = 76$) and, finally, small bathtubs (less than 90 L) ($n = 44$)¹. Around 25 % of the homes did not have a bathtub ($n = 124$).

Most housing units had up to two toilets. Most toilets were between 2 and 10 years old ($n = 232$), followed by those that were over ten years old ($n = 174$), and those that were less than 2 years old ($n = 55$). Less than a third of respondents ($n = 136$) reported to have at least one mechanism (dual flushing system or device to reduce the capacity of the toilet tank) to reduce water consumption in the toilet.

Practically all homes had a washing machine. Most of the respondents said to have a conventional washing machine of 4 years or older ($n = 230$) while the remainder either had an environmentally friendly ($n = 116$) or a conventional washing machine less than 4 years old ($n = 100$); only 2 respondents stated not to have washing machine. In any case, most of the washing machines were equipped with “half-load” system and more than half the respondents acknowledged using the “half-load” option of the washing machine (54.1 %) while one fourth admitted that they did not use it (24.6 %). The remainder did not have this option in their washing machine.

On the other hand, more than half of the respondents did not own a dishwasher ($n = 248$), but when available most dishwashers were environmentally friendly ($n = 64$) or conventional but less than 4 years old ($n = 47$). As a result most dishwashers were reported to have “half-load” systems. Almost half the respondents used the “half-load” option of the dishwasher (45.3 %) while almost a third did not use it (29.3 %). The remainder respondents did not have this option in the dishwasher.

¹Note that some homes have a combination of different categories.

Eventually, it is also relevant to mention that virtually all the respondents stated that their taps, showers, toilets, etc., did not leak and that over 90 % of the homes had individual water meters.

6.3 Description of indoor and outdoor water use habits

Water awareness campaigns ask for changes in the water use habits of the population. However, in many cases, as described before, campaigns repeat some messages over and over again without usually assessing whether those water habits that need change still hold true or not. In this section we will focus on regular habits of water use according to the survey.

Beginning with habits in the shower, almost half of the respondents spent between 2 and 5 min in the shower ($n = 180$), while over a third spent between 6–10 min ($n = 150$). The remainder stated to spend more than 10 min under the shower ($n = 66$).

One of the usual ways of wasting water in the shower is to let the water flow until it reaches a comfortable temperature. In most of cases the time did not exceed 10 s ($n = 282$). On the other hand, a small number ($n = 41$) of respondents affirmed to take a bath in a daily basis, while most of the respondents never took a bath ($n = 195$) or took it very occasionally (from 1–6 times per year, $n = 65$) preferring to shower instead.

Beyond water habits in the toilet we also asked for the frequency of use of water-related appliances. While as we commented most of the surveyed revealed not having a dishwasher, we observe that 66 % ($n = 126$) among those who did recognized to use it on a weekly basis. In any case, most of the surveyed ($n = 329$) said that they washed the dishes by hand on a daily basis. On the other hand three quarters of the sample used the washing machine on a weekly basis rather than on a daily basis.

Concerning water saving attitudes, in Table 3 we show the frequency with which respondents undertook different actions to save water. Eventually, when asked if they were planning to buy/upgrade water saving devices (flow restrictors, etc.), most respondents answered negatively ($n = 395$), while a number of respondents ($n = 36$) acknowledged that they did not know any device.

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In what concerns outdoor uses, garden irrigation was performed mainly using garden hoses ($n = 89$), followed by sprinklers ($n = 38$), drip irrigation ($n = 38$), and, finally by a myriad of other irrigation methods such as watering cans, buckets, and the like. In what concerns the origin of irrigation water, in most cases water came from the general network ($n = 130$), followed by stored rainwater ($n = 20$), wells ($n = 8$) or treated wastewater ($n = 6$). Finally when asked about how often did they emptied and refilled the swimming pools, few respondents knew the answer; yet, the most frequent response was “never” ($n = 48$).

6.4 Remembrance of past water awareness campaigns

In regard to awareness campaigns to save water, answers were similar between those who recalled at least one campaign ($n = 209$) and those who did not ($n = 236$). Concerning those who recalled at least one campaign, the most common media mentioned was television ($n = 182$), followed by the press ($n = 37$), institutional campaigns ($n = 35$), radio ($n = 32$), water companies ($n = 27$), street advertising ($n = 17$), friends, family and neighbors ($n = 17$), Internet ($n = 15$) or other channels ($n = 12$).

Through contingency table analysis we found a significant relation between the presence of water saving devices and the remembrance of water campaigns: with the presence of tap and toilet flow restrictors (Chi-square = 10.320; sign = 0.001) and shower flow restrictors (Chi-square = 7.559; sign = 0.006). At the same time we also found a positive and significant relation between the non-remembrance of drought campaigns and the refusal to buy water saving devices (Chi-square = 8.019; sign = 0.005). We also find a positive significant relations between comparing water consumption of different periods with the remembrance of water awareness campaigns (Chi-square = 10.488; sign = 0.001). There is also a significant relation between some water saving habits and the remembrance of water campaigns. For instance using the dishwasher at a full capacity (Chi-square = 9.817; sign = 0.020). Interestingly, there are also correlations for outdoor behaviors, such as watering the garden. Thus, people that remembered campaigns tended to have drip irrigation rather than sprinklers or

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hoses (Chi-square = 6.863; sign = 0.076). We observe therefore that there is a relation between the remembrance of water campaigns and the presence of water saving measures and certain ecologically friendly attitudes. However, we cannot be confident about the direction of the relation: that is, whether people concerned with water use tend to remember water campaigns more than those not concerned; or whether water awareness campaigns contributed to changing some habits and make more people concerned with water use.

We also found statistically significant relations between the working status and remembrance of water saving campaigns, with retired people remembering significantly less water campaigns (Chi-square = 14.195; sign = 0.048). Moreover, there was also a significant relation between income status and remembrance of water campaigns (Chi-square = 8.180; sign = 0.085), with respondents from low income homes significantly remembering less water campaigns than respondents with high income homes. The latter fact raises an important issue, as it may indicate that channels used by water awareness campaigns did not reach the whole population in the same manner.

7 Discussion and conclusions

If water awareness campaigns have to leave a longer imprint in the behavior of water users (Wang et al., 1999; Saurí, 2013) it is fundamental that they begin from certain knowledge of the residential and socio-demographic characteristics of the population targeted. In practice, however, this has been seldom the case because for the most part these campaigns have focused on the rather homogeneous world of Anglo-Saxon (Australia and the Western United States in particular) urban and especially suburban neighborhoods. To the extent that processes of urban sprawl are expanding into areas other than Anglo-American or Australian contexts and that the polarization of cities between high density and low density areas is becoming more widespread (EEA, 2006) these types of assessments may become more relevant.

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Our results may offer some interesting insights for the design and application of water awareness campaigns facing multiple urban and social realities involving areas with predominant indoor and outdoor water uses and also areas with mixed populations. In our case study and perhaps in contrast with Anglo-American and Australian cases, outdoor water consumptions appear to be relatively modest, because the predominantly small size of garden plots; the relatively scarce presence of lawns and the fact that only about a third of the sample had swimming pools (and half of these shared the pool with other neighbors).

Another important area of awareness campaigns able to produce long term results in water conservation concerns water saving fixtures in households. In this respect, our case study did not show much presence of these devices which on the one hand may indicate a potential area to increase savings in the future. At the same time, however, an overwhelming majority of respondents did not plan to buy/install such devices in the future presumably because they did not consider their consumptions high enough.

Finally, prudent habits of water use and their consolidation in time are perhaps one of the best yardsticks for measuring the effectiveness of awareness campaigns (Hurlmann et al., 2009). Therefore, it is crucial to ascertain whether recommendations for particular behaviors are grounded on a sound appraisal of existing water habits. In our case, water habits did not appear overly extravagant in terms of consumption. Thus almost half the sample declared to spend 5 min or less under the shower, and 60 % declared to never take a bath, contrasting with 12 % taking a bath daily. Most water awareness campaigns, at least in Spain, still insist on taking showers instead of baths when, according to this and other studies (see for example March et al., 2013) this is a habit already well-established in the collective mentality regarding personal hygiene. And, perhaps more importantly also because, in many cases, apartments, especially the older stock, do not have bathtubs.

As to water saving attitudes in the household (turning off the tap while brushing the teeth; operate washing machines and dishwashers at full loads, etc.) most respondents (above 70 % in all cases and above 80 % in most) declared to follow

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conservation behaviors. Bearing in mind that this type of questions may produce “sympathetic” answers, general assessment of habits indicates an already existing prudent behavior. Hence, perhaps it is more productive for campaigns to concentrate awareness efforts in other areas. This may be particularly relevant in cases where outdoor uses are more present, advising for instance to plant garden species more adapted to local climates, avoid water losses in the swimming pool by evaporation, or use mulching to improve the quality of the garden. In areas such as some of the municipalities studied here where low-density urbanism is dominant, awareness campaigns targeting outdoor uses may be more relevant than campaigns targeting all uses. Furthermore, awareness campaigns may take also a more proactive stance encouraging consumers (possibly in combination with some subsidies) to purchase relatively inexpensive water saving mechanisms such as flow regulators for taps or showers.

In conclusion, awareness campaigns during droughts therefore should be aware of the heterogeneity of users as well as the uneven territorial model where they are applied if they are to have a significant impact on users. Although the debate as to the relative merits of awareness campaigns vis à vis other alternatives of drought management and, more generally, water conservation (especially economic instruments) will continue, it is important to acknowledge that non-economic behavioral change such as that induced by these campaigns may last longer than that induced by rising prices or taxes while at the same time, avoiding to a large extent the traditional problems of equity and fairness that many times hamper the social effectiveness of economic measures.

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Table 1. Sample of municipalities, population, number of surveys and domestic water consumption.

Municipality	Population (1 Jan 2011) (INE, 2012)	Number of surveys	Water Consumption (lpd) (2012)
Alfàs del Pi	21 332	38	326
Altea	24 006	42	179
Calp	29 909	53	n.a
La Nucía	18 225	32	220
Polop	4294	8	283
Rojales	20 953	37	215
San Fulgencio	12 144	21	182
San Miguel de Salinas	8057	14	199
Teulada	14 778	26	n.d
Torreveija	101 091	179	218
Total	254 789	450	

Sources: population data from INE (2012). Domestic water consumption data from Mancomunidad de los Canales del Taibilla (2012), Hidraqua (2013) and Consorcio de Aguas de la Marina Baja websites (2012).

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Table 2. Examples of questions of the survey.

Topic	Questions
Socio-economic variables	Sex Age of the respondent Age groups at the home Nationality Employment status Net annual household income
Characteristics of the home	Type of building (apartment block, apartment block with common zone, semi-detached or detached house) Area of your home
Outdoor water use characteristics	Do you have a garden? What is the size of the garden? Which percentage of the garden is lawn? Do you have a swimming pool? What is the size of the swimming pool (in m ³)?
Indoor water appliances and water-saving devices	How many taps do you have at home (and which type of taps)? Do you have flow restrictor in the shower/s? What type of dishwasher do you have, in the case you have it?
Attitudes on indoor water use	Do you flush the toilet after every use? How often do you use your washing machine? Do you use the half load function in your dishwasher (in case you have it)?
Attitudes on outdoor water use	What type of watering system do you use for your garden? How often do you empty the swimming pool to refill it again?
Attitudes on water use in general	Do you track water consumption based on your billing? Are you planning to buy any water saving device for any of your water appliances?
Memories on water awareness campaigns	Do you remember any awareness campaign to save water?

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**Table 3.** Frequency of water saving attitudes (in %).

Water savings attitudes	Never	Sometimes	Frequently	Always
Turn off the tap while brushing the teeth	6.25	5.13	4.46	84.15
Pull the chain after every use	2.89	18.00	12.89	66.22
Turn on the washing machine once it is full	1.58	4.06	9.48	84.88
Turn on the dishwasher once it is full	4.52	5.53	8.54	81.41
Turn off the shower while soaping	18.22	6.00	5.33	70.44

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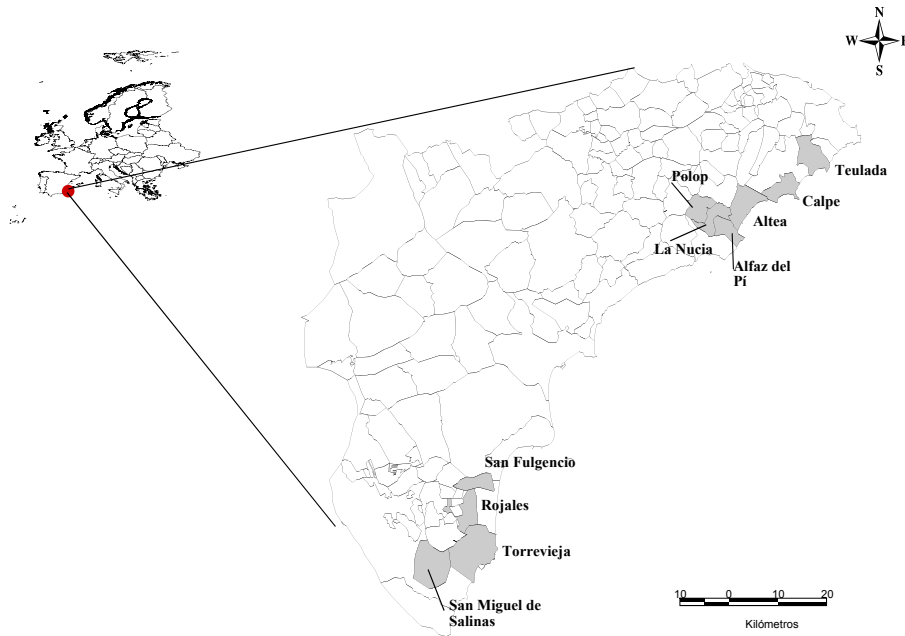
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**Figure 1.** Study area.